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PITT-03-6-016

March 7, 2006

Project No. 00234

Ms. Christine Williams
U.S. Environmental Protection Agency, Region I
1 Congress Street Suite 1100 (HBT)
Boston, MA 02114-2023

Mr. Louis Maccarone
Office of Waste Management
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, RI 02908-5767

Reference: Contract No. N62472-03-D-0057
Contract Task Order (CTO) Number 049

Subject: Responses to Comments for Draft Quality Assurance Project Plan for
1,4-Dioxane Ground-Water Investigation at IR Program Site 16
Former Naval Construction Battalion Center, Davisville

Dear Ms. Williams/Mr. Maccarone:

On behalf of the Navy, enclosed are responses to comments submitted by the U.S. Environmental Protection Agency (EPA), Region I and the State of Rhode Island Department of Environmental Management (RIDEM) in correspondence dated January 25, 2006 and February 16, 2006, respectively. The comments were submitted based on the EPA and RIDEM review of the Draft Quality Assurance Project Plan (QAPP) for the 1,4-dioxane sampling event scheduled for the Spring of 2006 at the Former Naval Construction Battalion Center (NCBC), Davisville, Site 16.

Please note that the Navy has tentatively scheduled the 1,4-dioxane sampling event to occur in April of 2006. Consequently, the Navy is requesting a teleconference with the EPA and the RIDEM in March to discuss the enclosed responses to comments. Please advise Mr. Fred Evans (601-595-0567) of teleconference dates and times that would be convenient to you during March. Thank you in advance for your assistance in this matter.

Please call me at 412-921-8887 if you have any questions regarding the enclosed document.

Sincerely,

Lee Ann Sinagoga
Contract Task Order (CTO) Manager

Enclosures (1)

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TETRA TECH NUS, INC.

PITT-03-6-016

Ms. Christine Williams/Mr. Louis Maccarone

March 7, 2006 – Page Two

cc: Mr. Fred Evans (1 copy)
Mr. David Barney, Navy Caretaker Site (CSO) (1 copy)
Dr. Ken Finkelstein, NOAA (1 copy)
Ms. Kathleen Campbell, CDW (1 copy)
Mr. Andrew Major, U.S. Fish and Wildlife Service (1 copy)
Mr. Steven King, Quonset Development Corporation (1 copy)
Ms. Marilyn Cohen, Town of North Kingston (1 copy)
Mr. Roger Boucher, Navy PMO (1 copy)
Mr. John Trepanowski, TtNUS PMO (1 copy)
Mr. Steve Vetere, TtNUS Boston (1 copy)
Ms. Kelly Carper, TtNUS Project Chemist (1 copy)
Ms. Lee Ann Sinagoga, TtNUS Project Manager (1 copy)
TtNUS Project Files, Sharon Currie (1 copy)

RESPONSES TO EPA COMMENTS DATED JANUARY 25, 2006
1,4-DIOXANE GROUND-WATER INVESTIGATION QAPP ADDENDUM AT
IR PROGRAM SITE 16
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RI

GENERAL COMMENTS

- 1. Comment:** The comments provided in this review are based upon knowledge of hydro-geological information available. Specifically, a complete, all encompassing depiction of groundwater flow patterns following the installation of additional groundwater monitoring wells related to the HRC[®] injection pilot study was not available. Also previous synoptic groundwater elevation measurements had omitted several key monitoring point locations, primarily several shallow monitoring wells where groundwater was noted to be below the intake of the pump, and was therefore not measured. As such, there is an incomplete picture of groundwater flow patterns at Site 16, especially in the shallower portions of the aquifer.

Additionally, this review did not have available any recent groundwater quality data relative to chlorinated volatile organic compounds (CVOC) from additional monitoring wells installed. Although the release of 1, 4-Dioxane may be unrelated to releases of CVOC, an updated distribution of CVOC concentrations following installation of the additional monitoring wells would be useful in assessing overall likely contaminant release locations.

A major concern is the focus of groundwater quality assessment for 1, 4-Dioxane primarily in the deep portions of the aquifer (7 out of 10 locations); with limited monitoring in the intermediate segment of the aquifer (3 out of 10 locations); and no samples being collected from the shallow portions of the Site 16 aquifer. Although 1, 4-Dioxane can be associated with CVOC it has different physical and chemical characteristics. It is also found as a separate component of paint and varnish strippers. The density of 1, 4-Dioxane is reported to be 1.028 gram per cubic centimeter (g/cm^3) or, essentially the same density of water. By way of comparison, the density of trichloroethylene (TCE) is 1.468 g/cm^3 . The density of cis 1, 2-dichloroethylene (cis 1, 2- DCE) is 1.274 g/cm^3 . Therefore, while the proposed groundwater sampling intervals might be suitable for CVOC constituents, they do not appear to be appropriate for monitoring of 1, 4-Dioxane. Releases of 1, 4-Dioxane that would have migrated to the groundwater table from one or more potential source areas would more likely be expected to be found in the shallow portions of the aquifer rather than the deep and intermediate intervals. This is especially true unless there were strong downward vertical hydraulic gradients. As such, primacy of groundwater monitoring locations should be on shallow and intermediate intervals of the aquifer for the monitoring of 1, 4-Dioxane. However, since there are relatively few available shallow intervals from which to sample, EPA will recommend a mixed group of sampling intervals.

A second concern relates to the solubility and partitioning coefficient of 1, 4-Dioxane. This chemical is completely soluble in water. The solubility is given as 43,100 milligrams per liter (mg/L). For comparison purposes, the solubility of trichloroethylene (TCE) is 1,100 mg/L and that of cis 1, 2-DCE is 3,500 mg/L. The partitioning coefficient of 1, 4-Dioxane also indicates that it is little retarded in the aquifer. For instance, the organic carbon partitioning coefficient (K_{oc}) is given as 3.5 milliliters per gram (ml/g). For TCE and cis 1, 2-DCE, the partitioning coefficients are given as 126 and 49 ml/g, respectively. These properties indicate that if 1, 4-Dioxane has been released at one or more of the site source areas it is likely to have migrated at a much faster velocity than the CVOC constituents. Therefore, while conducting some

sampling in the "source" areas (assuming that they have been identified) can be a useful component of the sampling design, it is important to weight the sampling effort to the forward edges of the "plumes" or beyond. That is, 1, 4-Dioxane would be expected to migrate in groundwater much faster than any of the CVOC constituents or degradation products.

While less critical, a third concern is that in Section 8.0, Sampling Process Design, there is reference to "within the plume" and "down gradient from the source." The use of this language and/or designation for sample locations has the potential to be somewhat misleading. It appears that there is more than one "plume" at Site 16, and not one with a universal source as implied by the designations made. There appear to be multiple sources and the plumes emanating from those sources commingle into a site-wide area of CVOC contamination. As an example, the area of the former fire training area and landfill (central portion of Site 16 adjacent to Allen Harbor) is a known, documented source area. However, Table 8-2 calls, for instance, MW16-45D, "within the plume." This location is clearly within a documented source area.

On the other hand, location MW16-39I is called "down gradient from source area MW16-38I." It has not been established that the area of MW16-38I is a source area. Rather, to date, it appears to be an area contaminated by one or more source areas, including from the landfill/fire training area, former Building 41 area, as well as possibly from the railroad spur area in which it is located. Three other proposed sample locations also potentially provide misleading information when they are denoted as being "within CVOC plume." These include MW16-02D, MW16-05D, and MW16-15D. In fact, it has been postulated by the Navy that MW16-15D is actually within a source area (although it is not clear that this has been demonstrated). Contamination at MW16-02D may be from the landfill/fire training area (radial flow, dipping low permeability layers), or from the Building 41 area, railroad spur area, or further up gradient. Nonetheless, the contamination at the three locations noted, do not appear to be from the same, single source.

The sampling locations for 1, 4-Dioxane should be revised to reflect its physical and chemical characteristics, likely pattern of migration in groundwater, and likely points of origin. The first two parameters suggest that monitoring points should be located in the shallow and intermediate intervals of the aquifer and at points some distance down gradient of suspected source areas. While 1, 4-Dioxane may be associated with CVOC it is also a constituent of paint and varnish strippers. Therefore, one location might be assumed to be former maintenance and storage facilities (Building 41 and 42?). Material might also have been disposed within the landfill/fire training area, and also released in the railroad spur area (area suspected of being points of origin for CVOC). A current assessment of groundwater flow patterns, primarily shallow and intermediate groundwater, should be made using updated, current information. EPA is looking forward to the Revised Phase II hydrological data package currently due March 31, 2006.

Therefore, while not all inclusive, monitoring points should include shallow and, if possible, intermediate wells at the three known or suspected source areas: (1) landfill/fire training area, (2) just east of the former Building 41 footprint; and (3.) railroad spur area. If samples are limited, priority should be given to sampling from the shallow aquifer. The locations of MW16-45D, MW16-15D are appropriate for the first two locations, except that samples should be collected from the shallow and the intermediate aquifer intervals, not deep as is planned. A third monitoring point should be located in the railroad spur area south of MW16-38I also with sample collection from the shallow and intermediate intervals of the aquifer. Locations designated as MW16-39I, MW16-56I, and MW16-05D may also be used; however, the sampling interval should be at the shallow segment of the aquifer in addition to the intermediate

interval. The sample locations MW16-50D and MW16-52D are also acceptable, although samples should be collected from the shallow and intermediate zones of the aquifer.

Of the remaining locations, MW16-10D may be a suitable "up gradient" location although sampling should be conducted from the shallow and intermediate portions of the aquifer. Sampling from the locations of MW16-02D and MW16-38I may be useful, but probably will not provide significant additional information relative to migration of 1, 4-Dioxane and may be eliminated. However, given the potential mobility of 1, 4-Dioxane and the groundwater flow patterns that are understood, to date, two areas are not covered in the monitoring program. The first is to the east of MW16-39I. Because of the solubility and low retardation characteristics of 1, 4-Dioxane, monitoring 500 feet further to the east is warranted. The second area is that of Allen Harbor, itself. The current monitoring is truncated to the north of the landfill/fire training area. A monitoring location should be established west of MW16-52D and north-northeast of MW16-20D along the shoreline of Allen Harbor.

2. EPA understands that this screening level 1,4-Dioxane investigation was to be accomplished using the existing monitoring well network and therefore has revised the list of wells to be sampled keeping the same number of locations. See table below:

Well Number	Justification
MW45I	Fire fighting training area source area with higher hits than shallow well
MW04S	Groundwater discharge area near firefighting training area
MW04I	Groundwater discharge area near firefighting training area – Intermediate level
MW37S	RR spur source area
MW25S	Downgradient of rr spur source area
MW12S	Upgradient shallow well
MW05S	Downgradient plume discharge area
MW05I	Intermediate level plume discharge area
MW23S	Within plume well downgradient of bldg 41 source area
MW59 I	Within plume well to give more geographic coverage than if MW23I were sampled

Response to EPA General Comment Nos. 1 and 2: As discussed between Ms. Christine Williams, USEPA, and Mr. Fred Evans, US Navy, the Navy is willing to discuss possible changes to the monitoring well list presented in the Quality Assurance Project Plan (QAPP) Addendum for the 1,4-Dioxane Groundwater Investigation at IR Program Site 16 (the 1,4-Dioxane QAPP) provided it is not used as a reason for requiring additional rounds of sampling to determine presence/non-presence of 1,4-Dioxane. The monitoring well list presented in the 1,4-Dioxane QAPP was developed in consultation with both U.S EPA Region I and the State of Rhode Island in the fall of 2004. Also, the Navy agreed to sample for 1,4-dioxane in March 2004, based on the assumption that the solvent may have been used as a solvent stabilizer for TCE at Site 16. In fact, two wells (MW16-39I and MW16-50D) were specifically added to the list of wells to be monitored at the request of the EPA. The well list was comprised primarily of monitoring wells screened in the deep overburden because the bulk of the volatile organic contamination at Site 16 is present in deep overburden zone. The wells listed in the 1,4-dioxane QAPP were sampled in the Fall of 2004; analytical results will be presented in the Supplemental Phase II Remedial Investigation Data Package for IR Site 16 currently scheduled to be published March 31, 2006.

The 1,4-Dioxane QAPP was prepared assuming that both EPA Region I and the State of Rhode Island concurred with the Fall 2004 monitoring well list. Altering the well list at this time

would mean that there will be only one set of data for most of the wells selected for 1,4-dioxane monitoring; the original plan was to have two sets of 1,4-dioxane data for each well (i.e., fall and spring sampling events). The Navy does not object to altering the monitoring well list for the spring event; however, the Navy requests a teleconference with the EPA Region I and the State of Rhode Island to resolve this issue because the recommendations presented in General EPA Comment Nos. 1 and 2 differ from recommendations provided and agreement reached in 2004. Also, the Navy does not believe that 1,4-dioxane would be more likely detected in the shallow zone because of its specific gravity. The Navy does believe that the solubility of 1,4-dioxane is an important physical factor. The specific gravity of 1,4-dioxane indicates that it is slightly denser than water. However, because of its relatively high solubility and low retardation factors, 1,4-dioxane is expected to migrate very quickly with the groundwater flow and more readily than trichloroethene. The groundwater flow patterns at Site 16 indicate that the groundwater (and any associated contamination) are moving (or have moved) from shallower zones to deeper zones. Thus, given the anticipated age of the contaminant releases at Site 16, the intermediate and deep overburden zones are the more critical in terms of environmental monitoring than the shallow overburden. With regard to the recommended monitoring well list provided by the EPA (above), the following should be considered:

- MW16-45I – The Navy agrees with this recommendation. Elevated TCE levels have been noted in both the intermediate and deep overburden wells and this location is a source area (the former FFTA).
- MW16-04S and MW16-04I – Only minor volatile organic contamination only been detected in these wells which are downgradient of MW16-45I (former FFTA). Consequently, monitoring of MW16-04D is recommended by the Navy because it is also downgradient of MW16-45I and displays higher concentrations of trichloroethene (340 ug/L in 2004 sampling).
- MW16-37S and MW16-25S – These wells are located in the general vicinity of the railroad spur area. The Navy originally selected MW16-38I to monitor this area; trichloroethene (TCE) concentrations in this well exceed those reported for both MW16-37S and MW16-25S. Given the EPA's concern for contamination in the shallow zone, the Navy recommends MW16-37S and MW16-37I because these are the most contaminated wells in the shallow and intermediate zone in the railroad spur area.
- MW16-12S – This well is located in the immediate vicinity of the former Building 41 area which is an area warranting additional investigation. Additionally, low-level TCE contamination was detected in this well in the 2004 groundwater sampling event. Consequently, the Navy does not believe this is a true upgradient monitoring well. The Navy recommends MW16-10D or MW16-55D as the upgradient location.
- MW16-05S and MW16-05I – The TCE concentration in the deep well (1,100 ug/L in 2004) at this location exceeds concentrations detected in either the shallow (non-detect in 2004) or intermediate depth wells (470 ug/L in 2004 sampling). Navy recommends monitoring the intermediate and deep wells in this plume discharge area (MW16-05I and MW16-05D).
- MWW16-23S and MW16-59I – These wells are located downgradient of the former Building 41 source area. The Navy originally selected MW16-15D for monitoring which is located in the immediate downgradient area and demonstrated higher TCE contamination than either MW16-23S or MW16-59I. The Navy recommends monitoring MW16-15D and MW-16-59I. Both wells are located downgradient of the former Building 41 area and both demonstrate TCE concentrations exceeding most other monitoring wells screened in either the intermediate or deep zone in this area of Site 16.

The Navy also continues to recommend monitoring of MW16-39I which is located at the eastern boundary of the Site 16 Phase II RI boundary. This well was originally recommended by EPA because of the TCE contamination being detected at the eastern (overall downgradient) boundary of Site 16 (i.e., in MW16-39I and MW16-57I).

SPECIFIC COMMENTS

3. **Comment:** Page 2-6, Section 2.2, Bullet Comment: The objective of this monitoring program is not clear from the number, locations, and aquifer intervals of the wells provided. A summary of the rationale for the "pre-selection" of the ten locations should be provided (Table 8-2 is inadequate). As noted in the General Comments above, the physical and chemical characteristics of 1, 4-Dioxane, do not support the development of a groundwater monitoring program focused primarily on the deep aquifer interval. Also, since 1, 4-Dioxane releases, if any, could be different from that of CVOC contaminants, some discussion of their potential origin should be provided to support the monitoring network. Also, this bullet notes that monitoring occurred during the fall of 2004. The results of this first monitoring period should be provided in this document.

Response: Please see response to General EPA Comment No. 1. Also, the discussion and rationale for the recommended monitoring wells presented above will be incorporated in Table 8-2 after the proposed teleconference with EPA and the State of Rhode Island.

4. **Comment:** Page 2-7, Section 2.3.4: The documents that are referred to in this section do not provide an updated description of the site hydro-geology. The conceptual site model and information contained in these documents have been commented on by USEPA in various ways. In particular, the nature of the contaminant "plume" versus "plumes" and "source" versus "sources" is a key change. Further, those documents also lack groundwater elevation data, primarily for the shallow aquifer, but also for other intervals to the east of the former Building 41. These issues were to be addressed in follow on hydro-geological work pursuant to preparation of the HRC @ pilot study program. That is, a more complete assessment of CVOC distribution and groundwater flow patterns was to be developed incorporating USEPA concerns. This information was to be submitted subsequent to the 2002 and 2003 Phase II Investigation reports. EPA understands that the Supplemental Phase II RI Data Package due date was recently extended under the FFA from January 16, 2005 to March 31, 2006. The EPA proposal for new sampling locations may change based on review of the information contained in the March 2006 submittal.

Response: As indicated by the reviewer, an updated description of the site hydro-geology and site conceptual model will be presented in Supplemental Phase II RI Data Package currently scheduled to be published March 31, 2006. Page 2.3.4 will be amended accordingly.

5. **Comment:** Page 6-1, Section 6.1: This objective for this investigation is in Section 2.2. Please revise the text accordingly.

Response: Agreed. The text will be amended per the reviewer's comment.

6. **Comment:** Page 7-1, Section 7.2: Although this review did not focus on sampling protocol, etc. it is noted that this section implies that at least 95% of the planned samples to be collected

must be valid. This would imply that all 10 would have to be valid. The limited number of samples leaves no room for less than perfect execution of the sampling program. Provision should be made for additional sample collection.

Response: Please note that additional soil and groundwater monitoring will be recommended as part of the Phase III QAPP currently being prepared for Site 16. If a recommended well can not be sampled for 1,4-dioxane during the planned 2006 sampling event, the sampling/analysis will take place as part of the Phase III investigation or other monitoring conducted for Site 16.

7. **Comment:** Page 8-1, Section 8.1, 1st Paragraph: This section states that "representative samples" will be collected. However, as noted in the General Comments, the sampling design does not adequately address the most likely segments of the aquifer to be affected by a release (if any) of 1, 4-Dioxane. The physical and chemical nature of 1, 4-Dioxane indicates that the fate and transport of this constituent in groundwater will be significantly different from that of CVOC such that simply sampling in the "area impacted by CVOC" is not satisfactory unless sampling occurs in the upper portions of the aquifer. Also, the down gradient areas have not been adequately addressed, especially to the east (of MW16-39I) and north-northeast (of MW16-02D) of the several suspected or documented release areas. Therefore, the Sampling Process Design outlined will not collect "representative samples" and does not adequately meet the stated objectives of the program. EPA has proposed a different sampling scheme in this comment letter.

Response: Please see Navy response to EPA General Comments No. 1 and 2.

8. **Comment:** Page 8-1, 2nd Paragraph: The groundwater monitoring locations and intervals outlined in this paragraph are inadequate to address the potential release and distribution of 1, 4-Dioxane in the Site 16 area. As noted in the General Comments, simple assessment in the areas and locations where elevated CVOC were detected is insufficient to evaluate the potential presence, nature and extent of 1, 4-Dioxane. While some 1, 4-Dioxane (if released) may be detected at these locations, the fate and transport of 1, 4-Dioxane is likely to be significantly different than CVOC found at Site 16 (TCE and cis 1, 2-DCE) in that it readily dissolves in water, has a density similar to water (much less than the CVOC constituents present), and has minimal retardation potential, and is not likely to break down in groundwater. Further, the sample locations are not adequately supported relative to groundwater flow patterns and specific documented or suspected source areas. Also, as noted in Specific Comments, the Phase II Investigation reports are incomplete in regard to delineating groundwater flow patterns, especially in the shallow aquifer. The information collected subsequent to those reports should be evaluated prior to finalizing 1, 4-Dioxane sampling locations. EPA may change the proposed new sampling scheme after review of the Navy's planned March 2006 submittal.

Response: Please see Navy response to EPA General Comments No. 1 and 2.

9. **Comment:** Page 8-4, Table 8-2: The rationale provided in the table are inadequate. First, as noted in previous comments above, the fate and transport characteristics of 1, 4-Dioxane suggest that it would most likely be detected (if present) in the upper portions of the aquifer, particularly the shallow, water table segment. Collection of samples at depth along where elevated CVOC has been detected is not sufficient justification for sampling at those depths. While sampling may certainly occur at those intervals, it is more important to sample at the

shallow and intermediate intervals. There are no shallow groundwater samples in the program and only three intermediate samples.

A further concern is the apparently indiscriminate use of CVOC "plume" and "source" when past investigations have clearly shown multiple likely source areas and more than one plume which may blend into an area of CVOC contamination. Adherence to the single plume and source terminology may inadvertently imply that there is only one source near the former Building 41 footprint and one plume migrating away from that location. This has not been shown to be the case. This problem appears to be related to lack of incorporation of post Phase II (2003) hydro-geological data and conceptual model formulation.

Response: Please see Navy response to EPA General Comments No. 1 and 2 and EPA Specific Comment No. 4. Also, the Supplemental Phase II Data Package (currently in preparation) will state that there is more than one source area at Site 16. The last sentence of Section 8.1 also acknowledges that there are source areas (not just a single source area) at Site 16.

10. **Comment:** Tetra Tech SOP "Groundwater Sample Acquisition and Onsite Water Quality Testing" page 19 of 25 - The criteria for turbidity, specific conductance, ORP, temperature, and pH are different than the criteria in the Region 1 Low Stress (low flow) SOP. Please verify that these criteria have been accepted by EPA and RIDEM. Please clarify in the text, the justification for deviating from the R1 low flow SOP. This QAPP is for 1,4-Dioxane analysis only. If Navy plans on sampling dissolved metals at the NCBC Site at another time, the R1 low flow SOP must be followed with no deviation.

Response: The reviewer is correct. The limits for turbidity, specific conductance, ORP, temperature, and pH presented in the USEPA Region I SOP for Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells (July 30, 1996; Revision 2) will be followed. The current version of the SOP presented in the Draft QAPP will be corrected.

**RESPONSES TO RIDEM COMMENTS DATED FEBRUARY 16, 2006
1,4-DIOXANE GROUND-WATER INVESTIGATION QAPP ADDENDUM AT
IR PROGRAM SITE 16
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RI**

1. **Comment:** It is felt that the objective of the sampling plan and the rationale for given sampling locations were not properly detailed. Please expound upon the objective in section two and the reasoning in Section 8.

Response: Please see the Navy's response to USEPA Comment No. 9.